PERKNITE (LIME-MAGNESIA ROCKS)[1]

THERE are sometimes associated with diorites, gabbros and peridotites, dark rocks composed largely, or entirely, of monoclinic amphibole or pyroxene, or both. These rocks differ mineralogically from diorites and gabbros, in containing little or no feldspar, and from peridotites in containing rhombic pyroxine or olivine in relatively small amount, if present at all. Chemically these rocks contain less alumina than diorites and gabbros, and less magnesia than peridotites. They are low in alumina and in the alkalis, moderately rich in lime, magnesia, and the iron oxides.

The chief constituents of perknite are monoclinic amphibole and monoclinic pyroxene; the secondary constituents rhombic pyroxene, olivine and feldspar; the accessories biotite, iron ore, etc., but only one of the primary constituents may be present with none of the secondary constituents or accessories. The existence of this group of rocks has long been recognized, but from their occurrence usually in small masses, and from the fact that many of them are of simple composition so that the self-explanatory names pyroxenite and amphibolite or hornblendite have answered, they have never been grouped together under one name.

In the State of New York[2] and in California[3] there are rocks containing both monoclinic pyroxene and amphibole as principal constituents, and doubtless this is likewise the case in many other parts of the world. Moreover, in California such rocks form areas of geological importance. There is, therefore, some reason in grouping all of these lime-magnesia rocks under a common name. It is proposed to call the group *perknite* from

[1] Published by permission of the Director of the U. S. Geological Survey.

[2] G. H. WILLIAMS: Am. Jour. Sci., Vol. XXXI, 1886, p. 40.

[3] TURNER: Am. Jour. Sci., Vol. V, 1898, p. 423. Turner and Ransome. Sonora folio.

the Greek word περκνος, meaning dark. It will include granolites of the following specific names:

Pyroxenite.

Hornblendite (Williams).

Websterite (Diallage and ortho-rhombic pyroxene) (Williams).

Diallagite.

Hornblende-hypersthene rock (Merrill).

Amphibole-pyroxene rock (Turner).

The group may be graphically represented by the method employed by Hobbs[1] and his representation of a composite pyroxenite will approximate to that of a typical perknite. The following table of analyses will give the reader a notion of the composition of the rocks which may be properly included in this group.

1. *Hornblendite.*—Geo. Steiger, analyst. This partial analysis is here published for the first time. The rock is from a dike cutting through the basement complex and overlying Cambrian rocks, 2 km north of Silver Peak village, in Esmeralda county, Nev. It is composed chiefly of green hornblende with some feldspar. The rock grades into a basic diorite.

2. *Amphibole-pyroxene rock.*—W. F. Hillebrand, analyst. Not before published. Rocks of this type are very abundant in Mariposa county, Cal. Mr. F. M. Anderson, of the University of California, has likewise collected them in northern California. This rock in its typical development is composed of original pyroxene and amphibole in grains of nearly equal size, with a little quartz and pyrrhotite. Scattered through the rock are phenocrysts about one centimeter in diameter, of brown amphibole, which contain in a poikilitic manner, as inclusions, the constituents of the groundmass.

3. *Perknite* (author's name, *peridotite*).—Belchertown. Bull. U. S. Geol. Survey, No. 168, p. 30. L. G. Eakins, analyst. The rock is composed of hornblende, pyroxene, biotite, olivine and magnetite.

[1] JOUR. GEOL., Vol. VIII, 1900, p. 14.

ANALYSES OF PERKNITES; LIME-MAGNESIA ROCKS.

Name	I Hornblendite	II Amphibole-pyroxene rock	III Perknite	IV Pyroxonite	V Websterite	VI Websterite	VII Composite pyroxonite
SiO_2	46.28	48.04	48.63	50.80	53.25	53.21	52.58
Al_2O_3	.....	7.82	5.32	3.40	2.80	1.94	3.69
Fe_2O_3	.....	2.01	2.91	1.39	.69	1.44	1.90
FeO	.....	9.32[1]	3.90	8.11	5.93	7.92	6.50
MgO	19.54	13.33	21.79	22.77	19.91	20.78	20.86
CaO	9.91	13.01	13.04	12.31	16.22	13.12	13.23
Na_2O	2.21	.69	.34	trace	.19	.11	.22
K_2O	1.89	.48	.23		trace	.07	.10
$H_2O-110°C$	.....	.17	2.81	.52	.05	.14	.57
$H_2O+110°C$	.....	2.90			.24	.87	
TiO_2	.....	1.16	.47	none	.....	.26	.11
ZrO_2	.....	.....	.....	.....	.....	trace	....
CO_2	.....	none	trace	.....	.....	.10	....
P_2O_5	.....	trace	.21	trace	.....	trace	....
SO_3	.....	.23[2]	.....	trace	.....	.....	....
S	.....	.90	.....	Cl. .24	.....	FeS_2 .03	....
V_2O_3	.....	.....	.....	.....	.....	.03	....
Cr_2O_3	.....	.90	.36	.32	.54	.20	....
NiO	.....	.....	.....	.....	.07	NiO + CoO .03	....
MnO	.....	none	.12	.17	.09	.22	.11
BaO	.....	none	trace	.....	.....	none	other constituents
SrO	.....	.....	.....	.....	.....	none	.50
Li_2O	.....	.....	.....	.....	.....	trace	....
Total	.....	100.06	100.13	100.03	99.98	100.47	100.49
Less O	.....	.45					
		99.61					

4. *Pyroxenite.*—Johnnycake road, Baltimore. Bull. U. S. Geol. Survey, No. 168, p. 42. Composed entirely of hypersthene and diallage.

5. *Websterite.*—From Mt. Diablo. W. H. Melville, analyst. Bull U. S. Geol. Survey, No. 168, p. 213, and Bull. Geol. Soc. Am., Vol. II, p. 406; analysis No. 242. The rock is composed of orthorhombic pyroxene and diallage.

[1] Owing to analytical reasons this determination of ferrous iron is unsatisfactory.—W. F. Hillebrand.

[2] This determination somewhat doubtful.—W. F. H.

6. *Websterite.*—Oakwood, Cecil county, Md. Composed of hypersthene and diallage. W. F. Hillebrand, analyst. Bull. U. S. Geol. Survey, No. 168, p. 43.

7. *Composite pyroxenite.*—Hobbs, JOUR. GEOL., Vol. VIII, p. 30. This analysis is a composite from three analyses of pyroxenites, and one analysis of a hornblende-hypersthene rock from Gallatin county, Mont.

Professor J. S. Diller, in his bulletin on "The Educational Series of Rock Specimens,"[1] introduces three specimens which would fall into the perknite group.

No. 110, a pyroxenite, is described by Professor George H. Williams.

No. 111, feldspathic peridotite, is described by Professor George H. Williams.

No. 113, Cortlandite (hornblende-peridotite), is described by Williams and Iddings. The rock is composed of brown hornblende, olivine, pyroxene, biotite, feldspar, and magnetite.

Some rocks that have been termed wehrlite will fall also into this group.

EFFUSIVE AND DIKE ROCKS

Corresponding to the plutonic group of perknite there undoubtedly occur effusive and dike rocks. Professor Rosenbusch regards hornblende-picrites as effusive, and some of these have the chemical and mineral composition of perknite. This will also be true of augitites, since in these augite or monoclinic pyroxene is the chief constituent.

Professor J. P. Iddings has been kind enough to criticise the above paper and calls my attention to the fact that my definition of perknite would bring into the group the kimberlite of Kentucky with 9.46 per cent. of lime, and the kimberlite of South Africa with 9.60 per cent. of lime, as wellas the amphibole-peridotite of Schriesheim with 7.22 per cent. of lime. He also calls attention to the fact that with hypersthene-enstatite rocks there

[1] Bull. U. S. Geol. Surv., No. 168.

may be very little lime present and yet they would not be peridotite. This brings us to the re-definition of peridotite, and I should define a peridotite chemically as a magnesia rock with usually less than 6 per cent. of lime. This would put a rock composed entirely of hypersthene or enstatite with the peridotites, where they certainly belong chemically.

H. W. TURNER.

SAN FRANCISCO, CAL.,
June 20, 1901.